Amendments to the Claims

Please amend the claims as follows:

Claims 1-40 (canceled)

Claim 41. (currently amended) A method for correlating a vehicle with the road on which it travels based on cellular communication, the method comprising the steps of:

gathering a sequence of cellular network events related to one or more mobile units, and a physical, geographically-defined, accurate location of each mobile unit determined by a physical geographically-defined, accurate location determination system when each cellular network event occurs, such cellular network events and physical, geographically-defined accurate locations being gathered during one or more drives and then stored as entries in a learnt database as a location reference; and

conducting analysis of a new sequence of cellular network events related to a particular mobile unit, the new sequence of cellular network activity events being gathered during a new drive and is independent of physical, geographically-defined location information, in conjunction with the learnt database to correlate the new sequence of cellular network events to a physical geographic location;

whereas the new sequence of cellular network events is extrinsically collected from the base stations or the controllers or main switching systems or communication links between them and whereas the new sequence of cellular network events is processed to overcome the problem of similar sequences for neighboring routes and whereas the step of conducting analysis is performed for areas in which at least two roads are covered, at least partially, by the same two or more cells.

Claim 42. (previously presented) The method of claim 41, wherein the sequence of cellular network events may include a handover event and wherein the step of gathering a sequence of cellular network events further comprises the step of:

clustering handover chains in the learnt database according to a similarity algorithm so that each cluster contains at least similar N chains ($N<=M$, $N=>1$), where N and M may vary for different route sections and where M is the number of times a route was covered in the learning process.

Claim 43. (previously presented) The method of claim 42, wherein the similarity algorithm comprises the step of:

each of the chains in a cluster of L cells has at least K (K<=L) cells that appear in the same order as in a header, where K and L may vary for different route sections.

Claim 44. (previously presented) The method of claim 42, wherein ambiguous chain clusters, which are clusters in which at least one of the chains has similarity to chains related to a different route section, are filtered.

Claim 45. (previously presented) The method of claim 44, wherein clusters have similarity if at least for one of the chains within a first cluster, another chain is found in a second cluster that includes at least J (J<=L) cells that appear in the same order, and this chain relates to a different route section than the first cluster, where J and L may vary for different route sections, and, if the first and second cluster have similarity, both clusters are filtered.

Claim 46. (previously presented) The method of claim 44, wherein a cluster has similarity to a raw data chain if at least for one of the chains within the cluster, another chain is found in the raw data that includes at least J (J<=L) cells that appear in the same order, and this chain relates to a different route section than the cluster, where J and L may vary for different route sections, and, the cluster having similarity is filtered.

Claim 47. (previously presented) The method of claim 41, wherein the step of gathering a sequence of events includes calculating an accuracy level of a handover in one or a combination of the following ways:

using signal strength measurements to detect sharp decays in signal strength resulting in a handover and thus determine handovers accuracy level;

measuring the location spread of handovers between the same cells for different trips over the same route to determine handover accuracy level and average location.

Claim 48. (previously presented) The method of claim 41, wherein the step of conducting analysis further comprises:

matching chains from new drives to the learnt database by searching for a chain of J cells that has at least K (K<=J) cells that appear in the same order,

both in a chain from the new drive as well as in a chain from the learnt database, whereas J and K may vary for different route sections;

assigning the route of the chain from the learnt database to the new chain that was matched.

Claim 49. (previously presented) The method of claim 48, wherein the step of conducting analysis includes a secondary matching procedure comprising the step of matching cells before and after the match previously detected by following raw data chains in the learnt database backward and forward relative to the matched chain and looking for an L out of M (L<=M) cells match where as M is typically smaller than J, and whereas J is the number of cells in the chain, and where as L and M may vary for different route sections.

Claim 50. (previously presented) The method of claim 41, wherein the step of conducting analysis detects the vehicle location at specific points along the route by:

extracting handover information comprised of cell pairs, physical geographically-defined location, timing, and accuracy information from handover chains in the learnt database that match a new chain of handovers; and

calculating location and accuracy of handovers in the new chain of handovers according to the handover information extracted from the learnt database that relate to the same route section and contain the same cell pairs.

Claim 51. (previously presented) The method as in claim 41, where in the step of conducting analysis to correlate the new sequence of events to a specific route, further comprises conducting analysis to detect traffic incidents by:

if another mobile unit is in a call and no new handovers have been received for a time T, a distance D to a farthest possible handover location to a possible next cell is used to calculate a maximal possible speed at a current route section as follows: Max Speed <= D/T and if this speed is below a speed threshold S then a possible incident report is issued for this route section.

Claim 52. (previously presented) The method as in claim 41, wherein the step of conducting analysis is based only on cell ID data.

Claim 53. (currently amended) A method for correlating a vehicle with the road on which it travels based on cellular communication, the method comprising the steps of:

gathering a sequence of cellular network events related to one or more mobile units, and a physical, geographically-defined, accurate location of each mobile unit determined by a physical geographically-defined, accurate location determination system when each cellular network event occurs, such cellular network events and physical, geographically-defined accurate locations being gathered during one or more drives and then stored~~ing~~ as entries ~~this information~~ in~~to~~ a learnt database as location reference~~s~~; and

conducting analysis of a new sequence of cellular network events related to a particular mobile unit, the new sequence of cellular network activity events being gathered during ~~on~~ a new drive and is independent of the physical, geographically-defined location information, ~~of the particular mobile unit~~ in conjunction with the learnt database to correlate the new sequence of cellular network events to a physical geographic location ~~identify a match~~;

conducting analysis of a new sequence of cellular network events related to a particular mobile unit, the new sequence of cellular network activity events being gathered during a new drive and is independent of physical, geographically-defined location information, in conjunction with the learnt database to correlate the new sequence of cellular network events to a physical geographic location;

~~wherein~~ whereas the new sequence of cellular network events is extrinsically collected from the base stations or the controllers or main switching systems or communication links between them and whereas the new sequence of cellular network events is processed to overcome the problem of similar sequences for neighboring routes; and

wherein the step of conducting analysis further comprises: ~~is based on extraction of handover related messages, only from the communication links between the switch and the base station controllers in a cellular network~~ matching chains from new drives to the learnt database by searching for a chain of J cells that has at least K (K<=J) cells that appear in the same order, both in a chain from the new drive as well as in a chain from the learnt database, whereas J and K may vary for different route sections; and

assigning the route of the chain from the learnt database to the new chain that was matched.

Claim 54. (previously presented) The method as in claim 41, wherein the step of conducting analysis is based on extracting new events from a different percentage of calls in different parts of the cellular system.

Claim 55. (canceled)

Claim 56. (previously presented) The method of claim 42, wherein the step of conducting analysis further comprises:

matching handover chains from new drives to handover chains in the learnt database; and

filtering out new handover chains that were matched with handover chains in the learnt database which represent more than one route section

Claim 57. (previously presented) The method according to claim 42, wherein the step of conducting analysis includes detecting physical geographic locations of mobile unit at specific points along a route by:

extracting handover information including cell pairs, physical geographically-defined location, timing, and accuracy information from handover chains in the learnt database for a new handover chain that includes cell pairs that match with cell pairs in the handover chain in the learnt database; and

calculating the physical geographic location and accuracy of handovers in the new handover chain according to the handover information extracted from the learnt database that relates to the same route section and contains the same cell pairs.

Claim 58. (previously presented) The method according to claim 57, wherein the physical geographically-defined location, timing and accuracy information is further used to calculate traffic speed per each route section.

Claim 59. (previously presented) The method according to claim 57, wherein the physical geographically-defined location, timing and accuracy information is used to detect traffic incidents.

Claim 60. (previously presented) The method of claim 41, wherein the step of conducting analysis detects traffic incidents by:

collecting handover time density information for each route section;

alerting of probable incidents whenever the handover time density of a new chain decreases rapidly.

Claim 61. (previously presented) The method of claim 41, wherein the step of conducting analysis detects incident clearance by:

collecting handover time density information for each route section; and

notifying of incident clearance whenever, after an incident, the density of new chains increases significantly.

Claim 62. (previously presented) The method of claim 41, wherein the step of conducting analysis detects traffic speed by:

including a calibration stage in which traffic speed of a route section is correlated with the rate of handovers for this route section at the same time; the handover rate is measured continuously and by comparing to the handover rate in the calibration stage the speed for the route section is extracted.

Claim 63. (previously presented) A method for correlating a vehicle with the road it travels on based on cellular communication, the method comprising the steps of:

collecting handover sequences statistics for a relevant area;

collecting road traffic volume information for each route in the relevant area from external sources for roads that differ in traffic conditions;

assigning handover sequences to routes according to volume comparison analysis; and

conducting analysis of new handover sequences from new drives in the relevant area in conjunction with the previously collected handover and traffic volume information to identify a route at certain time points during cellular phone calls.

Claim 64. (currently amended) The method of claim ~~41~~53, wherein the step of conducting analysis is performed for areas in which at least two roads are covered, at least partially, by the same two or more cells.

Claim 65. (previously presented) The method of claim 41, wherein virtual sensors detect the speed at certain specific locations across routes within a covered area and emulate the

communication protocol between traditional road sensors and the control center in a hybrid traffic control system.

Claim 66. (previously presented) The method of claim 41, wherein the step of conducting analysis further comprises continuously updating the learnt database by:

estimating the physical geographic location of handovers within matched sequences that do not appear in the database; and

adding new matched sequences to the learnt database

Claim 67. (previously presented) The method according to claim 42, wherein the step of conducting analysis further comprises detecting changes in the cellular system and adjusting the learnt database by:

monitoring the matching rates of chains or clusters of chains with chains in the learnt database to detect decreases in the matching rates;

find new clusters that were rarely matched or not matched at all, that appear in the same locations, according to preceding or following chains; and

compare statistics of the number of matches per cluster and find new clusters to replace clusters that are rarely matched.